James ASR & Carbo Detect*

Simple colored dye field test to detect Alkali Silica reaction (ASR) Carbo Detect—simple colored dye field test for carbonation

Features and Benefits

- **Test can be carried out completely on site.**
- **Utilizes only two environmentally safe dyes.**
- **Identifies ASR in concrete and differentiates ASR from other causes of degradation.**
- **Results obtained in less than five minutes are easy to interpret.**
- **Economic, fast and easy to use.**

**US Patent No. 5,739,035 and other patents pending.*
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James ASR & Carbo Detect™

ASR Detect

Method

Simply apply each of the two reagents to the broken surface of a concrete core drilled in a suspect structure and rinse off the excess. On ASR contaminated concrete, the resultant stains reveal the presence of ASR.

The stain's distribution shows the extent of ASR in the concrete, and their proximity to different components of the aggregate gives clues to the source of trouble. The two gels that are identified-one staining yellow, the other pink - indicate the stage of ASR's progression. Yellow signals that degradation has begun. Pink warns that degradation is advancing.

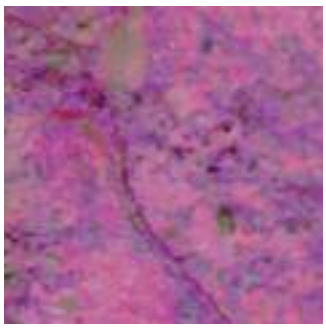
Typically, ASR occurs in cracks and these cracks often cut through the aggregate and usually do not follow the aggregate-paste boundaries. ASR tends to fill air voids.

Applications

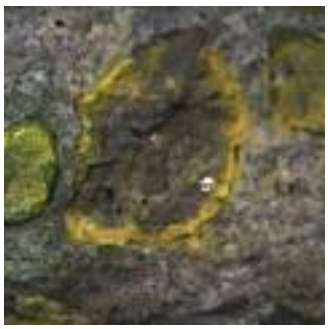
ASR Detect is both a practical and a scientific tool. It's principal application is analyzing existing concrete structures. By identifying ASR deterioration in its earliest stages, ASR Detect facilitates the problem being identified when remediation techniques can be applied; for example, treating the concrete with a lithium-bearing solution to inhibit further deterioration. Where deterioration is advanced, ASR Detect provides a clear picture of the extent and depth of the damage.

As a scientific tool, ASR Detect can be applied to improving the understanding of where, how and why ASR occurs. That understanding is basic to developing ASR preventatives that allow high-alkali cements or poor-quality aggregates to be used in concrete mixes without risking the development of ASR.

Untreated concrete.



Concrete tested with pink gel only showing advanced ASR degradation.



Concrete tested with yellow gel only showing beginning stages of ASR degradation.

Concrete tested with pink and yellow gels showing both beginning and advanced stages of ASR.

Carbo Detect

Technical

Carbonation is one of the two main causes of corrosion of steel in concrete, the other is chloride attack. The result of the interaction of carbon dioxide gas in the atmosphere with the alkaline hydroxides in the concrete, the carbonation process effectively drops the pH of the concrete to a level where the steel will corrode. The carbon dioxide dissolves in water to form carbonic acid, which can migrate to the reinforcing steel if the concrete cover is low or if the concrete is of poor quality (open pore structure, low cement content, high water cement ratio, or poor curing of the concrete). Carbonation is more common in old structures, particularly buildings.

Concrete Core showing uncarbonated area at the left

Method

Carbo Detect reagent is a type of pH indicator which will indicate the change of pH on a freshly exposed concrete surface. The indicator is simply sprayed on the surface to be checked. The indicator will change to pink in uncarbonated concrete and remain colorless when sprayed on carbonated (low pH) concrete. If the concrete test area is very dry, a light misting with water will help show the color.

By spraying the indicator along a core drilled from the top surface down to the reinforcement bar it can be readily seen how far the carbonation has progressed and therefore the outlook for corrosion, which will only occur after carbonation reaches the reinforcement bar.

Care should be taken to prevent drilling and coring dust from contaminating the surface to be tested.

Technical Specifications

Concrete Core Showing Advanced ASR

Technical

One of the primary causes of premature concrete deterioration is alkali-silica reaction (ASR). ASR causes concrete to deteriorate when sodium and/or potassium from the cement attacks silica rich components in the aggregate, producing gels that expand and eventually crack the structure.

ASR Detect was developed by Los Alamos National Laboratory as part of its ongoing effort to characterize concrete degradation mechanisms and to improve concrete durability.

ASR Detect exploits the cation-exchange and compositional properties of ASR gels to pinpoint ASR degradation in a chemically specific way. Most gels contain cations (positively charged atoms or molecules) that readily exchange with other cations in solution. ASR Detect's two reagents react with cations found in the two gels associated with ASR. The first reagent exchanges sodium with the potassium found in some ASR gels and then reacts to form a bright yellow precipitate. The second reagent reacts with calcium-rich ASR gel to form a bright pink stain. In concrete containing ASR, the result is a brightly colored surface showing the presence of the targeted gels; concrete with no ASR is unaffected.

Sales Numbers

I-AS-3000 ASR-detect System

I-CB-6000 Carbo-detect System
200 ml of reagent — sufficient for approximately 100 tests Sprayer Carrying Case

NDT JAMES INSTRUMENTS INC.
NON DESTRUCTIVE TESTING SYSTEMS
3727 North Kedzie Avenue,
Chicago, Illinois 60618
1-800-426-6500 (773) 463-6565
FAX (773) 463-0009
e-mail: info@ndtjames.com
http://www.ndtjames.com